Flightfax

ARMY AVIATION RISK-MANAGEMENT INFORMATION

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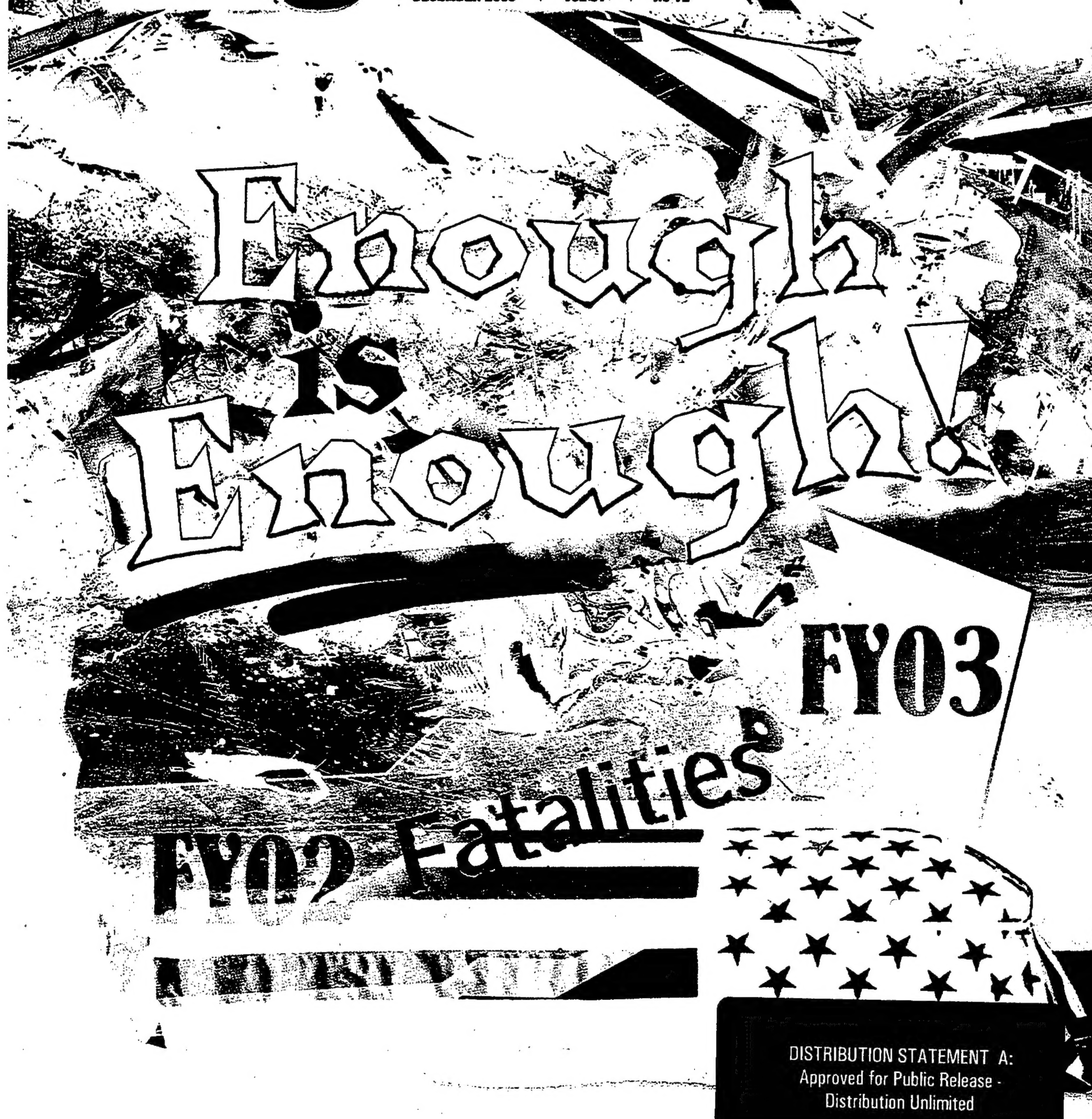

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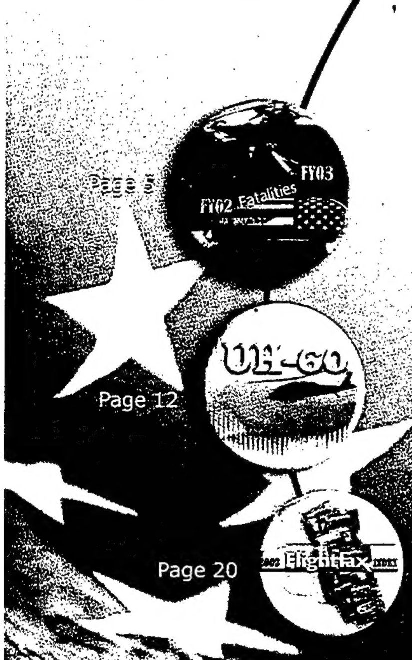

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Flightfax is published by the U.S. Army Safety Center, Building 4905, Fifth Avenue, Fort Rucker, Alabama 36362-5363. Questions about the editorial issues addressed in *Flightfax* should be directed to the editor at DSN 558-9855 (334-255-9855) or flightfax@safetycenter.army.mil. Distribution questions should be directed to Media and Marketing at DSN 558-2062 (334-255-2062).

JOSEPH A. SMITH
Brigadier General, U.S. Army
Commanding

DASAF's Corner

FROM THE DIRECTOR OF ARMY SAFETY

20040204 259

Safety Success in Korea: Leadership in Action

As our Army continues to operate at an OPTEMPO not seen in 50 years, the safety challenges our commands face are unique and require unique initiatives. As I analyzed recent safety statistics across our MACOMs, Korea's figures caught my attention. Over the last 5 years, 6.9 percent of the Army's Soldiers have been stationed in Korea; however, Korea has only suffered 4.5 percent of our accident fatalities.

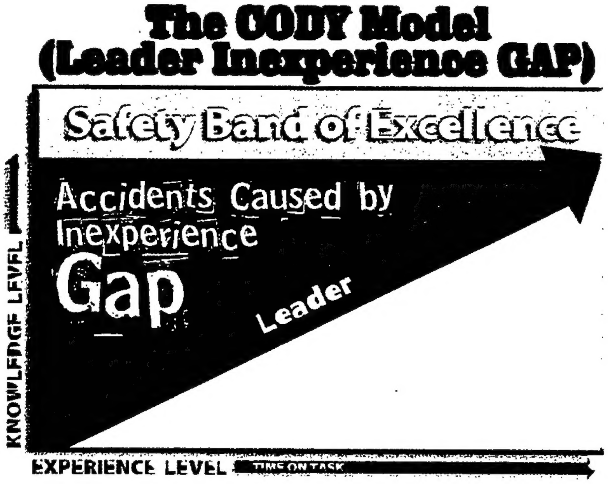
The power of this statistic is significant to me considering the current world environment. For the past 50 years, we've asked our Soldiers in Korea to remain at the highest level of readiness every day. We've asked them to train and operate at that level in one of the world's harshest environments, and to do so with a new team of Soldiers every year. We've been patching the line across from the world's sixth largest Army with 50 years of 1-year Band-Aids™. What could be more challenging? Yet, Korea continues to have a lower accident rate than the Army at large.

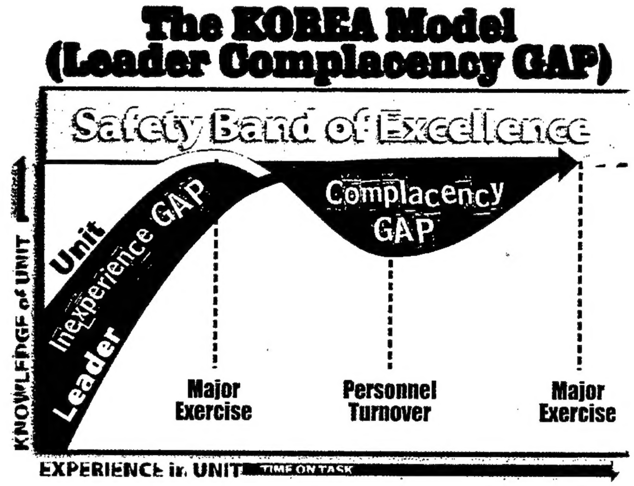
Now we are asking the entire Army, including the Guard and Reserve, to prepare for and face an unpredictable enemy in a harsh environment with inexperienced Soldiers. My hypothesis is that through 50 years of lessons learned, Korea has developed some safety initiatives that could be shared as Army "best practices." Although I've never been stationed in Korea, I visited there for the first time in years last month. What I found was an organization that understands its hazards and overcomes them through effective control measures.

Aviation operations accentuate Korea's challenges. The 8- to 15-percent monthly aviator turnover makes crew coordination within combat teams a constant battle. Twelve-month tours force leaders to rush pilots through training to get 10 months of flying before they leave. Most of all, terrain, power lines, weather, and communication dead zones create extra hazards. Added is the fact that Korea consistently receives the highest percentage of first-tour aviators, including 62 percent of UH-60 pilots last year.

Korea's solution: Leader involvement at all levels, including the implementation of an **8th Army Aviation Review Team.** This team creates control measures by developing, prioritizing, and funding aviation safety initiatives. The program's success is proven in the numbers—six aviation-related fatalities during the last 3 years. This is well below the Army average, and yet they accomplished this while exceeding their flying hour program.

The 8th Army Aviation Review Team continues to improve their safety rates in a challenging environment. They are working to build a Korea **"Green Platoon,"** hiring DACs to train aviators to





fly safely. The team inspired leaders to build remote weather terminals and communication towers to prevent dead space and predict harsh weather in mountainous regions.

Control measures, however, do nothing unless they are implemented and supervised by leaders. To ensure that happens, 8th Army leadership applies the **"3-Deep"** concept, involving leaders at multiple levels to provide young leaders with the necessary knowledge.

When a Soldier signs into 2ID, they are given a small pamphlet called ***The Tribal History.*** That history lists every fatal accident in 2ID over the last 10 years, along with their causes. On Day 1, senior leaders give junior leaders the historical knowledge to keep their Soldiers safe. During mission planning, junior leaders must brief their commanders in detail on their control measures and contingency plans. Mission briefs are NOT done in passing or over the phone. Commanders train junior leaders on the five steps of risk management so they can safely perform their mission. The junior leaders then reinforce those five steps to their Soldiers in the **"safety-minute"** just prior to mission execution.

Korea has identified a further hazard threatening the Army as junior leaders gain experience. I have previously discussed the hazard of the **"Inexperience Gap"** in the Cody Model, showing how accidents occur when junior leaders lack experience in mitigating risks. Time on task (experience) reduces this hazard and enhances junior leaders' risk management skills. Until that point, it's the junior leader's inexperience that puts themselves and their Soldiers at increased risk.

But there is a second risk that can occur after these junior leaders have gained some experience. As junior leaders remain in position after a high OPTEMPO period, new Soldiers will move into their units to replace others who are leaving. When this turnover occurs, those junior leaders' safety experience will exceed that of their new Soldiers. However, in the young leader's mind, he may still think of his unit being as capable as it was during the high OPTEMPO point. This mindset can cause junior leaders to be overconfident and assume their Soldiers will understand and correctly implement control measures. This assumption breeds complacency, causing leaders not to properly supervise their new, less-experienced Soldiers.

Units in Korea are not risk-averse; they don't have that luxury. They must be ready to "fight tonight" every night. What they have done is identify the challenges of their mission and mitigate risks by combining safety initiatives and good old-fashioned leadership. As the rest of the Army's challenges look more and more like Korea's, we can look to Korea's 50 years of experience for guidance.

Keep your leader lights on! Joe Smith

FY03 Aviation Safety Performance Review

Charisse Lyle
U.S. Army Safety Center

The number of Fiscal Year (FY) 2003 Class A accidents remained fairly constant from FY02 (30 versus 28, respectively). However, Army fatalities more than doubled from FY02 to FY03 (17 versus 35). There were 10 fatal accidents during FY03: three involving definite or suspected inadvertent instrument meteorological conditions (IIMC) (i.e., fog, sandstorms), two wire strikes, one brownout during an attempted landing, one impact with the ground during aerial gunnery (caused by an over-aggressive bank at low altitude), a fast-rope accident, and a fixed-wing accident which occurred while executing stall procedures during a maintenance test flight. The cause of one accident was undetermined.

As of 29 October 2003, there were 124 Class A through C accidents in FY03, resulting in a cost of over $242 million. Over a third (37 percent) of the accidents occurred in theater during missions associated with Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). Brownouts were by far the top accident event in FY03 (16 percent of the 124 accidents), with the majority (85 percent) occurring in OEF- and OIF-related operations.

Airframes

The table on page 7 depicts the accident number breakdown by accident class and fatalities for each aircraft type.

UH/MH-60 Black Hawk (32 percent)

Over a third of the FY03 Class A accidents and the majority of the fatalities occurred in the Black Hawk. Eighty-two percent of the fatalities during FY03 occurred in six Black Hawk accidents. The high number of fatalities was due, in part, to the fact that there were

troops onboard in some of the accidents. In one accident alone there were 11 fatalities. IIMC was a definite or suspected contributing factor in two accidents resulting in nine fatalities. There were two wire strikes, one of which resulted in three fatalities. Three of the Class A accidents were caused by loss of visual references due to rotor-induced brownout during takeoffs and landings. One of these accidents resulted in a fatality when a passenger was thrown from the aircraft during the crash. A mid-air collision during a night formation flight resulted in a Class A accident but, thankfully, no fatalities.

The Black Hawk also had the majority of Class B and C accidents for this timeframe. There were three accidents in which the main rotor blade struck the AN/ALQ-144 or the tail rotor drive shaft cover during a hard landing. In another Class C accident, a jammed round of an M-60D machine gun accidentally discharged through the floor of the aircraft. There were two instances of in-flight aircraft component detachments caused by materiel failure: the anti-collision light shield and the tail de-ice bracket. In both cases, the components struck the tail rotor.

AH-64 Apache (26 percent)

The Apache had the second-highest number of accidents in FY03. Brownout conditions were contributory in seven of the accidents, six of which occurred in Iraq. There were two wire strikes, one resulting in two fatalities. An IIMC accident resulted in two fatalities.

In one accident, a malfunction of the digital automatic stability equipment (DASE) computer caused uncommanded flight control inputs, which resulted in the aircraft impacting the ground in a tail-low, left-turn attitude. Other events included inadvertent drift while at an out-of-ground effect (OGE) hover resulting in a tree strike, and a bird strike.

There were four reported auxiliary power unit (APU) clutch failures during FY03, all resulting in Class C accidents. Thus far in FY04, we have had two Class A accidents involving APU clutch failures. In both cases, the crews reportedly received warning light indications and were able to land the aircraft and egress without injury. AMCOM Engineering has identified a potential corrective action. In the interim, Safety of Flight (SOF) Message AH-64-02-08 specifies inspection procedures for the power takeoff (PTO) clutch assembly. An updated SOF currently is being disseminated that provides further instruction and inspection procedures to address this problem.

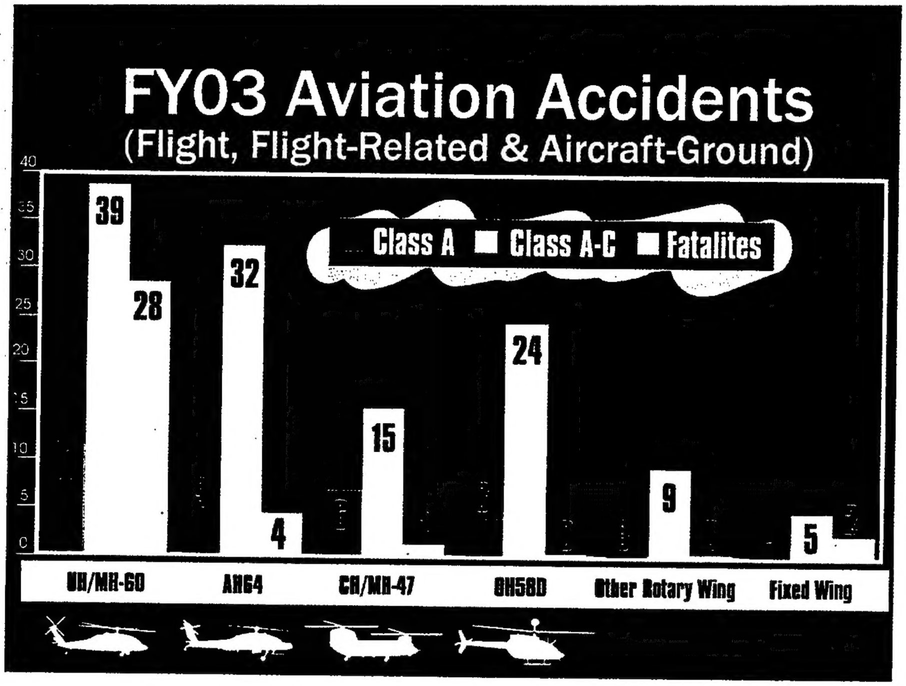
OH-58D Kiowa Warrior (KW) (19 percent)

In comparison to the other force modernized aircraft, the KW had the lowest number of Class A accidents and no fatalities. Brownout or whiteout was a contributing factor in two of the Class A accidents. Eight of the KW accidents involved emergency procedures training (full authority digital electronic control [FADEC] manual throttle operations [4], autorotations [3], and a simulated engine failure [1]). The majority of these mishaps resulted in Class C rotor or engine overspeeds or overtorques and/or hard landings. However, one KW crashed into the ground, resulting in Class B damage. One FADEC failure was reported during this timeframe.

Two Class C accidents involved inadvertent drift into a tree while at an OGE hover during night battle position operations. Another involved a wire strike during night vision goggle (NVG) terrain flight. In this case, a flight of two KWs conducting NVG multiship training descended into a valley for low level flight. The lead aircraft struck a set of three power lines. The crew escaped without injury, and there was minor damage to the aircraft.

CH/MH-47 Chinook (12 percent)

The Chinook had six Class A accidents and one fatality in FY03. However, when compared to the other force modernized aircraft, it had the lowest number of Class C accidents. Sixty percent (9) of the accidents occurred in theater during OEF- and OIF-related operations. Five involved brownout conditions (four combined in OEF and OIF). One involved a wire strike during a precautionary landing.



environments, but delay flight training until deployment into those conditions." In this same article, DES also notes a weakness in instrument proficiency and makes the observation that, "Instrument proficiency is a by-product of how frequently crewmembers fly in instrument conditions."

There was a flight-related accident involving a fast rope insertion in which a soldier fell approximately 20 feet to his death. In another Class A accident, there was a hard landing following failure of the #1 engine. In one Class C accident, the aircraft was taxiing forward when the road under the aircraft collapsed.

Fixed Wing (4 percent)

There were five Class A through C fixed-wing accidents, three of which involved C-12 aircraft. One of these accidents occurred during the conduct of stall procedures on a maintenance test flight. In this particular accident, the C-12 aircraft entered a right spinning descent from 9,000 feet and crashed, causing two fatalities.

Summary

Environmental conditions were a contributing factor in many of the accidents during FY03. IIMC claimed 11 lives, and brownout conditions contributed to 20 accidents. During their assistance visits, the Directorate of Evaluation and Standardization (DES) identified poor environmental training programs as a trend across the Army (see the article "Standardization Review" in this edition): "Poor environmental training programs commonly address academic training of unique environments, but delay flight training until deployment into those conditions." In this same article, DES also notes a weakness in instrument proficiency and makes the observation that, "Instrument proficiency is a by-product of how frequently crewmembers fly in instrument conditions."

The Army Safety Center is involved in pursuing three initiatives to combat the brownout problem: (1) advanced simulators that replicate the building of brownout at slow airspeeds; (2) the Tactile Situation Awareness System (TSAS); and (3) aircrew coordination training.

The Safety Center also is developing an automated risk management tool to help commanders and mission planners identify accident hazards and apply controls to mitigate risks. Training initiatives include on-site assistance visits and an NCO professional development mobile training team to help corps-, division-, and brigade-size units and installations in need of safety assistance. The Safety Center assistance team will "train the trainers," leaving units with a core of trained personnel capable of more fully integrating risk management into their operations and missions. ♦

<u>Editor's note</u>: *These statistics are current from the Safety Center database as of 29 October 2003. Delayed reports could change these figures somewhat in the coming months.*

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STACOMs are Back!

CPT Thad D. Fineran
Directorate of Evaluation and Standardization
Fort Rucker, AL

Most of you will recognize the Standardization Communication (STACOM) format from previous editions of *Flightfax*. The Directorate of Evaluation and Standardization (DES), Fort Rucker, AL, is reintroducing the STACOM as a viable method of communicating clarification information for standardization personnel. These STACOMs will be prepared by DES and staffed through appropriate proponents to clarify issues when published guidance is ambiguous or can be misinterpreted. The information generally precedes official Department of the Army (DA) policy and is valid until changes are made to respective publications. Previously issued STACOMs should be considered expired and no longer referenced. The STACOM is published to enhance aviation operations and training support and, as such, is informative in nature and NOT regulatory. Look forward to seeing STACOMs regularly in *Flightfax*.

Standardization

2003 Flightfax "Standardization Review"

Another year of assistance visits and evaluations within the Army Aviation community has been completed by DES. DES conducts these unit evaluations as a Headquarters, Department of the Army (HQDA) field operating agency, with a mission of providing real-time feedback on the standardization of aircrew training programs at the individual and crew level. DES attempts to execute this mission in accordance with (IAW) Army Regulation (AR) 95-1, *Flight Regulations*, and by visiting aviation units every 18 to 24 months. As part of our mission to assist aviation units in standardization, we identify trend information and prepare it for commanders and crewmembers at all levels. In the next few pages, we'd like to share some of the common trends found during the previous 12 months.

Aircrew Training Program (ATP) management

One of the most significant administrative issues DES encounters is a lack of ATP management. Leadership understanding of the ATP is weak, and many unit standardization pilots (SPs) manage the ATP in its entirety. A predominant reason for this is a lack of core training to educate commanders about their own program. DES recommends that commanders at all levels take an active role in educating themselves on and administering their unit ATP. This active role requires a comprehensive understanding of Training Circular (TC) 1-210, *The Aircrew Training Program (Commander's Guide to Individual and Crew Training)*, and AR 95-1. This understanding is a fundamental tenet of successful standardization

programs.

Additional ATP management issues of note include task list development and actual accomplishment of ATP requirements. TC 1-210 addresses the importance of individual task list development as a joint venture between the commander and the standardization officer. This team assesses the unit mission essential task list (METL) and determines appropriate task requirements for each Modified Table of Organization and Equipment (MTOE) or Table of Distribution and Allowances (TDA) position on flight status. Task iteration requirements are then determined by assessing the individual crewmember's proficiency and experience. Generic task lists (every crewmember in the unit has the same mission tasks listed on the critical task list [CTL]) are difficult for most commanders to justify when assessing unit requirements IAW TC 1-210. Units that have successfully addressed this issue frequently have completed position-specific task lists filed under each appropriate paragraph and line number of the MTOE or TDA. Then, when a new crewmember is integrated, that task list is loaded and personal data is completed.

Communication

When addressing the accomplishment of ATP requirements, commanders must closely monitor the use of extensions and waivers. In most circumstances, these tools are justified courses of action as explained in AR 95-1. The requirements of transformation, deployment cycles, and maintenance and safety messages all plague crewmembers in their accomplishment of ATP requirements. Many other actions, however, distract otherwise proactive crewmembers and do not warrant a commander's extension. Likewise, the 30-day extension period authorized in AR 95-1 should not be the normal extension time. One highly effective extension seen this year was an 8-hour extension for completion of a –10 examination. That Annual Proficiency and Readiness Test (APART) requirement probably won't be overlooked again. Finally, commanders and unit SPs should review AR 95-1, paragraph 4-10, when authorizing extensions and/or waivers. Make sure the appropriate restrictions are annotated in the crewmember's individual aircrew training folder (IATF). The crewmember also must know the process should he or she not complete requirements in the allotted time.

For those ATPs that include nonrated crewmembers (NCMs), rated standardization personnel frequently overlook nonrated standardization training. The cargo community has an established DA school to train flight and standardization instructors, and the utility community will soon have one. Successful crewmember standardization requires command and SP support of nonrated training and evaluation.

Additional training requirements

TC 1-210 addresses additional training requirements as part of the unit ATP. The requirements of aircraft survivability equipment training (ASET); fratricide prevention training; aeromedical training; nuclear, biological, and chemical (NBC) training; and environmental training are the most common areas of difficulty. ASET-AT is available as an unclassified, easily duplicated training program, yet many aviation units have difficulty organizing and tracking effective ASET. Under this same topic, aircrew familiarity with Mode IV operations and other installed countermeasures is marginal unless they are trained frequently. The most successful unit programs DES has seen require routine ASET and secure communications

operations.

Using this tenet of recency, one successful National Guard facility maintained 100-percent proficiency with secure communications in a very simple manner—base operations only communicated secure. All flight operations required the crews to have, fill, and operate avionics with appropriate keys. While not directly a part of ASET, the principles this National Guard unit used enabled effective operations and practice year-round, not just on field exercises. It is this type of ingenuity and practice that can make your unit ASET interesting, not just reminiscent of the ASET II laser disc training.

Fratricide prevention and aeromedical training also are overlooked frequently. Field Manual (FM) 3-04.301 has been out for over 3 years now. Academic requirements should have covered all applicable topic areas, but DES frequently finds academic training hasn't prepared crewmembers for evaluation in this topic. Fratricide prevention is equally weak. Given Army Aviation operations in joint and coalition environments, fratricide prevention should be instructed routinely. Successful training programs often address recent incidents and missions, and much information can be gathered from the Center for Army Lessons Learned (CALL) and joint publications.

NBC training is another marginal area found in most visited aviation units. TC 1-210 requires commanders to develop an NBC evaluation program along with the mandated NBC training listed in each ATM, meaning he or she must determine individual tasks that must be evaluated sometime during a no-notice, APART, or Army Readiness and Training Evaluation Program (ARTEP) evaluation. Many weak evaluation programs only require one or two tasks to be evaluated in mission oriented protective posture (MOPP) gear, one of which is preflighting the aircraft. DES recommends that commanders identify multiple primary base tasks (involving flight) as evaluation task requirements under MOPP conditions to ensure thorough proficiency and familiarity with NBC equipment.

Environmental training is another key requirement and is especially pertinent to units deployed in support of Operation Enduring Freedom (OEF) and Operation Iraqi Freedom (OIF). Common weaknesses in environmental training predominantly revolve around a lack of flight training in difficult environmental conditions. Snow, sand, and dust are the most common visibility-limiting environmental conditions, but crewmembers do not routinely practice in these conditions. Since these particular environmental conditions are seasonal in nature, commanders must take advantage of them when they occur and plan unit training to maximize crewmember familiarity and proficiency. Poor environmental training programs commonly address academic training of unique environments, but delay flight training until deployment into those conditions. If your aviation unit has the potential to deploy into a snow, sand, or dust environment, DES recommends that environmental training, both academic and flight, be an active part of crewmember progression and evaluation.

Individual and crew proficiency

From a crewmember's perspective, probably the most interesting information is how individuals have been doing on proficiency evaluations. Overall flight proficiency is, for the most part, meeting the standards set forth in the aircrew training manuals (ATMs). Some particular areas of emphasis that need to be addressed are academic knowledge, instrument proficiency, crew coordination, and emergency procedures understanding.

Academic knowledge, while not the ultimate proficiency indicator, might well be a cornerstone of safe and efficient flight operations. We're not talking about the gear ratio of the intermediate gearbox here; we're talking about basic, working knowledge of topics outlined in the ATM. As many crewmembers know

from personal experience, most evaluations are not unsatisfactory because of a maneuver or decision—rather, they just didn't know what they were talking about. It's often difficult to identify time to spend "in the books." We must take this responsibility seriously, however, and realize our study time will not fall solely during the hours spent at the hangar. Units that have active, no-notice oral and written evaluations frequently do very well in the academic topics evaluated by DES. One successful unit recently administered a written limit and emergency procedures test 30 days before their DES evaluation. Both the satisfactory and unsatisfactory evaluations were annotated in the crewmembers' IATFs. Nearly every crewmember performed exceptionally during the subsequent evaluation, largely due to their unit's effective no-notice evaluation program.

Instrument proficiency is a by-product of how frequently crewmembers fly in instrument conditions. A lot of units are not taking the time to plan and execute effective instrument training. Many crewmembers are not comfortable in instrument meteorological conditions (IMC). While effective synthetic flight training system (SFTS) usage can be helpful for some airframes, nothing substitutes the intensity of actual instrument conditions. This requires a priority shift for many aviation units since instrument flight training is not always compatible with mission requirements or post support. Again, ingenuity and resourcefulness can integrate effective instrument training into your ATP. As a commander or SP, ask yourself how comfortable you are with a flight of five going inadvertent IMC, and work backwards in your continuation training programs to ensure effective instrument proficiency in your crews.

Crew coordination is a constant issue that can never be over-emphasized. Part of every maneuver performed in aviation operations, crew coordination must be trained and enforced from the top down. Like other important flight tasks, crew coordination failures must result in unsatisfactory evaluations. To emphasize this, crew coordination is mandated as an integral part of every APART evaluation. DES also recommends including elements of crew coordination in mission briefings, crew briefings, and after-action reviews. Leadership also needs to be familiar with the five objectives of crew coordination and spot-check aircrews to ensure they are being achieved.

Surprisingly, emergency procedures training is an area in which most units could be more effective. DES predominantly finds that crewmembers know underlined procedures well from a rote memorization standpoint, but when asked to identify malfunctions in the aircraft or respond to emergency situations the success rate drops drastically. This is normally an indicator of standardization personnel taking proficiency for granted or routinely training emergency procedures the same way over and over again. As mentioned earlier, crewmembers that know emergency procedures well belong to units that have a strong, frequent, and accountable no-notice program in place.

Conclusion

Hopefully, these trends will benefit your ATPs and provide guidance in preparing for your next evaluation. The trends addressed here are only a fraction of our assessment data. If you would like clarification or further information from us, please contact your respective aircraft representative at DES. As mandated by the Director of DES, we are here to help. Our philosophy and charter require assistance on par with evaluation, so please contact us with your questions or concerns. A contact roster can be found in the DES Information Portal within AKO. ♦

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Dust Takeoffs and Landings in the UH-60

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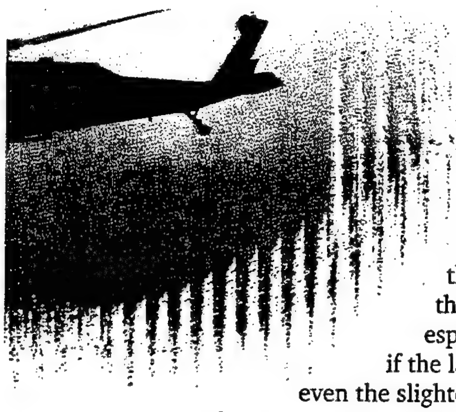
Perhaps the most dangerous phase of a UH-60 mission in a dusty environment is takeoff or landing. Missions in such an environment are required all over the world, and UH-60 crews must be proficient and confident in their ability to execute under these conditions. Attitude, understanding, and skill are required for safe mission accomplishment. Planning and clear crew briefings are irreplaceable as well. Unfortunately, however, references on the subject are limited, and dangerous misconceptions abound.

Information about UH-60 operations in blowing sand or dust can be found in the UH-60 Aircrew Training Manual (ATM) (Training Circular [TC] 1-212) and in Field Manual (FM) 1-202, *Environmental Flight*. Many units also have 3000-series tasks and standing operating procedures (SOPs) for operations in snow, sand, and dust. This article is intended to take a serious look at the different approaches these publications reference on landings and takeoffs in "brownout" conditions. The same technique is not correct for all situations. Most importantly, there is a myth in the Black Hawk community that outrunning the dust cloud and "planting it in there" is the only way to land in a dusty environment. I believe this is a dangerous attitude that has caused and will continue to cause many accidents and incidents in dusty environments.

According to FM 1-202, "The best procedure to minimize blowing sand and dust is a running landing. If the terrain does not permit a running landing, an approach to touchdown should be made. A landing should not be made to a hover." Many aviators focus on the first sentence in the quote, when in almost all dusty field environments "the terrain does not permit a running landing." In the next paragraph, FM 1-202 states, "If a running landing can be made, the touchdown roll should be kept to a minimum to prevent the possibility of overloading the landing gear." Once again, the situation where a roll-on is appropriate is rare, and even the slightest ground roll can cause significant aircraft damage if the terrain is not even and smooth.

Regarding takeoff, FM 1-202 says, "If rotor blades...stir up sand and dust, the takeoff should be executed as rapidly as possible." The aviator must focus on the word "possible" and make a calm, performance planning card (PPC)-planned, instrument-referenced takeoff—but more on that later.

Obviously, TC 1-212 addresses the same issue, but with the UH-60 specifically in mind. Task 1028, "Perform VMC Approach" and Task 1018, "Perform VMC Takeoff," provide snow, sand, and dust considerations. These considerations compare three methods of termination for the approach: to a point out of ground effect (OGE), to the surface with forward speed, and to the surface with no forward speed. We will take a look at the last two methods. The ATM recommends the "with forward speed" technique for "an improved landing surface or suitable area with minimal ground references." Improved and suitable landing areas are hard to find in the field. The ATM goes on to say, "Apply slight aft cyclic at touchdown to prevent burying the wheels...." To prevent serious damage to the rotor blades and aft portion of the aircraft while



using this method, the aviator must correlate Task 1029, "Perform a Roll-on Landing," by centering the cyclic before lowering the collective. Reversing the order often has caused main rotor contact with the aft portion of the aircraft. This is especially important if the landing area is even the slightest bit down-slope—a condition difficult to deduce from above and especially at night.

Perhaps the most important statement the ATM makes about takeoff is, "Be prepared to transition to instruments and execute an instrument takeoff if ground reference is lost." This can be uneventful **IF** the pilots work together. The pilots must know the maximum torque available and the torque required to hover. If the torque is too low, the aircraft will settle. If too much collective is applied, the rotor will droop and the aircraft will settle. Ground contact while in instrument meteorological conditions (IMC) is not desired for obvious reasons. Even with a wings-level attitude, drift is extremely difficult to detect.

There is no substitute for an accurate and briefed PPC. If the aircraft is heavy or the conditions extreme, the crew may be IMC for several seconds. This is not a problem if appropriate power is set and maintained during the instrument takeoff (ITO). If a brownout takeoff is likely, then the pilots should look at the instruments prior to focusing outside and taking off. This makes the transition back to instruments smooth, since you were just looking at them and are expecting to look at them again. Also, the pilot not on the controls needs to attend to nothing else during the takeoff other than assisting the pilot on the controls. Riding the controls will minimize reaction time if inputs are required or spatial disorientation requires a transfer of controls.

Let's take an organized look at the landing sequence. I'd like to put it in a checklist format I often use for crew briefings:

- **Wind:** When single-ship, land into the wind. When in formation (echelon is ideal), lead should put the wind on the front quarter of the formation side. This will pull the dust away from the formation. Consider having the upwind pilot on the controls during a crosswind.
- **Power:** Know your maximum torque available. The excitement of an IMC go-around is not the time to guess how much torque will bleed off the rotor.
- **Go-around:** Brief go-arounds before the mission, and plan your go-around path during every approach. Rebrief the go-around contingency to your crew during the approach. Glance at your instruments as you begin the approach so your eyes are used to referencing your attitude on instruments in case you have to during a go-around. In an echelon formation, the ideal go-around for an individual aircraft in the flight is to continue straight forward out of the dust and land when the terrain is suitable. (This does not alleviate the necessity of briefing the direction to circle if a go-around to another full approach is necessary. In any event, the initial path out of a dust cloud must be forward to prevent drift or collision with another aircraft.)
- **Co-pilot backup:** The pilot not on the controls must stop all other activity during the landing and back up the pilot on the controls. Riding the controls makes an immediate transfer of controls possible, should that become necessary. A dangerous amount of drift can develop in just a couple seconds—seconds that cannot be revisited.
- **Crew chief (CE) assertiveness:** The ATM and FM 1-202 say all doors and windows should be closed during a dust landing. I would add to this by saying they should be closed when they no longer need to be open. CEs must understand their critical role during landing. Before the mission, the entire crew must be clear on how the CE will call the dust cloud and clear the aircraft down. Standard calls like, "dust is at the tail, my door, your door, clear down left, clear down right" are critical for the pilot to understand the rate at which the dust is approaching and when it is safe to completely lower the collective. The CE must have his head outside the gunner window for these calls to be accurate. The CEs should agree on who will call the dust to eliminate confusion, and they also must announce any drift immediately, clearly, and concisely (e.g., "drifting right").

■ **Analyze terrain on short final:** Rocks, slopes, ditches, gullies, waddis, and any uneven terrain can cause serious damage even without any ground roll. Ground roll on this type of terrain makes damage more likely and dynamic rollover a real possibility. Look at the terrain and decide if that is what you want to land on before you get engulfed in a cloud of dust. If the terrain is unsuitable, continue forward in your previously reconned go-around path until you find a suitable spot.

■ **Brakes:** If you make the decision to land on anything but smooth, level terrain, set the brakes. This simple precaution will minimize the possibility of damage to the underside of the aircraft that even the slightest ground roll can cause.

■ **Choose a reference:** Identify a good reference (if available), such as a bush or a distinct pattern in the ground or rocks. Make your approach (if you intend to have no ground roll) very close to your reference so you can see it as long as possible. If you can, put this reference right next to or under your chin bubble. Observe how your reference point lines up with other points to prevent the aircraft from drifting and pivoting around the nose.

■ **Scan:** This is probably the most important thing you can do during a dust landing. The UH-60 offers three windows for the pilot to look through for close references during a dust landing. Deliberately scan from one to the other. Look out the bottom of the windshield at the ground close to the aircraft. When that gets dusty, look out the chin bubble and then out the door over your shoulder. When that gets dusty, look out front. If you brownout while looking through any window and your next window also is browned out, it's time to do a go-around. As the rotor wash pushes the cloud past the aircraft in the worst dust, all three windows rarely are browned out completely at the same instant if you look at the ground very close to the aircraft.

■ **Announce loss of visual contact with the ground:** Pilots must immediately inform each other if they lose sight of the ground. Awareness of what the other can see will aid in the decision to transfer controls or go-around.

■ **Lighting:** A narrow beam searchlight during night vision goggle (NVG) dust operations is ideal for lighting up your chosen reference point. Keep the light on the reference point, but deliberately scan through the other windows. If available, chem lights taped to your reference spot make visual cues last longer in a dust cloud. If your lights cause disorientation, dim them or turn them off. Be aware of the crater illusion if you tuck the searchlight beam under the nose.

■ **CEs call "clear down":** CEs need to understand they must tell the pilot as soon as the aircraft is safe to continue down. Terse directions to move slightly for a safe spot are often necessary (e.g., "hover right, two, one, clear down left, clear down right"). This is the most critical phase of the landing, and a competent CE can save the day with timely drift calls (e.g., "drifting back, drifting right"). Once the aircraft is on the ground, only the CE can tell if it is safe to lower the collective all the way down.

■ **Anyone can call a go-around:** There are an infinite number of circumstances that might require a go-around. All crewmembers need to understand that if they doubt the landing can be completed safely, it is their responsibility to call a go-around. No matter who calls the go-around, the pilot on the controls needs to immediately execute and ask questions later. The hazard requiring the go-around might not allow for an immediate explanation.

In conclusion, there is such a thing as an unsuitable landing area. Aviators get so focused on their mission they often fixate on a landing zone (LZ) without considering ways to mitigate the risk of the hazards present. As funny as it sounds, no one would land on a lake or in a volcano because these are unacceptable LZs, but aviators routinely land on rough, rocky, dusty terrain that has facilitated many fatal accidents. Although many missions require challenging LZs, some areas are not safe and often require an adjustment of only a few yards to find a suitable spot. Analyze your LZ and make a decision. Consider the best spot, especially if there is a better spot just a few yards away. A landing with any forward motion at termination is rarely appropriate in a field environment. The attitude that "the Black Hawk can take it" is a myth. If you freight-train a helicopter into an LZ "within Chapter 5 limits," you are asking for dynamic rollover or rotor contact with something other than air. ♦

—The author, CW3 Thomas J. Cuscito Jr., has over 3,000 total hours, with 1,900 as a UH-60 IP/IFE. CW3 Cuscito has flown more than 2,500 hours in the UH-60 in Germany, Fort Rucker, Korea, and Fort Campbell, and has been an IP since 1995. He is serving currently as an RC-12 Company Safety Officer in B Co, 1st MI BN, Wiesbaden, Germany. He may be contacted by mail at B Co, 1st MI BN, CMR 467 Box 726, APO AE 09096; by telephone at DSN 314-337-5250/6173, commercial 011-49-611-705-5250/6173; or by e-mail at thomas.cuscito@us.army.mil.

NCO CORNER

Wrong Part, No Book

MSG Shane Curtis
U.S. Army Safety Center

A buddy and I were talking about the Chinook and all the changes made over the years. Our talk brought back old memories from years ago regarding why you should always use "The Book."

I was crewing a CH-47C in 1979, when it was known as a "Baby C" aircraft because it had two L-7 type engines. A "Super C" aircraft, on the other hand, had two L-11-ASA or L-11 Ram-D type engines installed. The Ram-D engine was to be installed on the new CH-47D as an upgrade from the L-11 ASA engine. The CH-47D was still another 2 years or so away from being fielded to its first unit; so, if you were crewing a Super C, you had the best the Army had to offer in the Chinook world.

Sometime in 1980, we had the L-11 Ram-D engines installed on our CH-47 Baby C, making it a Super C. The wiring for the airframe and engine combination was different, which meant our aircraft had to be wired for the bigger engines. That task was completed without a hitch.

The next step was for our aviation intermediate maintenance (AVIM) support unit to install the new L-11 Ram-D engines. Production on the L-11-ASA and Ram-D engines had a pretty quick turnaround time, so the engines were being delivered to the units before portions of their manuals ever got there.

Experienced maintainers didn't need The Book anyway. Wasn't maintenance for replacement of the engines the same? Nope! We could install the engine with or without the transmission already installed. We decided to install the engine with the transmission. This task wasn't hard and everything looked the same, so the new maintenance manuals weren't used.

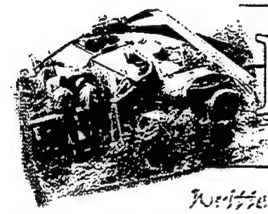
My flight engineer (FE) and I flew a 2-hour mission on our Super C shortly after the engine upgrade. When we were back on the ground, we noticed oil seeping from the front of the #1 engine. The oil was coming from where the engine transmission and the engine connected. We thought the wrong torque had been used during installation, so we did a retorque on the mounts.

Despite our "fix," the engine transmission started to leak again during the next flight. This time we removed the engine transmission and noticed something unusual—the backside was burned black! The snubber had melted to nothing, and the lip on the quill shaft was razor sharp. We finally realized something was definitely wrong! What did The Book say about converting from the L-7 engine to the L-11 engine? Well, The Book said to use the new, longer quill shaft with the L-11 engine.

Problem solved, right? Remember, the leak was on the #1 engine. It never occurred to us to check the #2 engine. You guessed it; that engine started leaking at the same place during the next flight. The first thing we did was pull the engine transmission to see how badly it was burned. It was bad!

We were lucky—this could have ended in tragedy. A second or two longer, and those engine transmissions could have come apart on us. Remember to read The Book. It doesn't matter how often you've performed a job; if you don't have the most current and up-to-date information, you'll never know what changes to make. Both our unit and the AVIM unit learned a valuable lesson that day: always read The Book and stay aware of any changes. The Books are published and changed for a reason—to keep YOU alive and safe. ♦

—MSG Shane Curtis is an Aviation Systems Safety Manager for the CH-47 at the U.S. Army Safety Center. He can be reached at DSN 558-9859 (334-255-9859), or e-mail shane.curtis@safetycenter.army.mil.



Investigators' Forum

Written by accident investigators to provide major lessons learned from recent centralized accident investigations.

What We Do...

Insight from an aviation accident investigator

CW4 David Laramore
U.S. Army Safety Center

As an Army Aviator and accident investigator assigned to the U.S. Army Safety Center (USASC), a lot of people have asked me what accident boards really do when they are deployed. I would like to explain our purpose and goals so everyone can understand what we do and how we do it.

The primary objectives of our investigations are to identify causal factors and/or system deficiencies and then make recommendations to remedy causes and minimize the chance of similar recurrences. To put it simply, we want to know what happened, why it happened, and what can be done to prevent it from happening again. Our goals are to save lives, reduce damage to equipment, and maintain the fighting force for commanders.

Before explaining how the board works, I'd like to start with a little background information. Inevitably, we have to start our investigations by quoting a regulation. According to Army Regulation (AR) 385-40, any Class A or Class B accident, along with any Class C aviation accident, must be reported to the USASC. For all Class A and selected Class B accidents, our first-up team is dispatched from Fort Rucker, AL, to conduct a Centralized Accident Investigation (CAI).

This team includes, at a minimum, two people—a board president (LTC or MAJ) and a board recorder (CW4 or CW5)—from the USASC. These two individuals are the core of the accident board, and they are schoolhouse-trained in accident investigation procedures. A point of contact is assigned as well, usually a trained safety officer assigned by the appointing authority. Since we don't know everything about all the systems in the Army inventory, we also have subject-matter experts (SMEs) to assist us. The SMEs are drawn from other units and include (at a minimum) an instructor pilot (IP), a flight surgeon, a maintenance test pilot, and a technical inspector for the involved aircraft. Technical advisors from Corpus Christi Army Depot (CCAD), TX, and the system manufacturer also may be used.

So, where does the priority of our investigations fall in the grand scheme of things? There are three types of investigations that can occur: a Criminal Investigation Division (CID) investigation; an accident investigation; and a collateral investigation. Representatives from CID are on-site before we arrive in most cases, and they either will have released the site or be able to tell us that no criminal intent was found. If we start an investigation and find criminal intent, we stop and let CID take over. Only the factual, non-privileged portions of our investigation are then turned over to them.

In an accident investigation, we have priority for access to evidence, witnesses, and the accident scene. However, a spirit of cooperation with the collateral board is required. In that spirit, we begin to turn over common-source, factual, non-privileged information to the collateral board as soon as we have reviewed and recorded it.

Now, let's get into the meat of the subject. What do we do, and how do we do it? The first-up team is required to be deployable within 2 hours of notification. The team is placed on orders

for the duration of the investigation, typically 14 to 21 days; however, we do not leave until we are sure we have all the facts and evidence. I will say this now and a couple more times as we go: OUR INVESTIGATIONS ARE FOR ACCIDENT PREVENTION PURPOSES ONLY! People must know we need the facts so we can prevent the same accident from happening in the future.

Accident investigations are conducted FOR ACCIDENT PREVENTION PURPOSES ONLY! We want to make sure the same accident doesn't happen again to your unit or another somewhere in the world.

No witness statements are taken; instead, we conduct interviews with those involved and write witness summaries. This is so people will feel free to talk to us without fear of retribution from the chain of command. Remember, our investigations are not for legal or punitive purposes, and the USASC has an assigned legal officer to protect the confidentiality of the information we gather.

Everyone involved in an accident investigation must be as honest and forthright as possible. We need to know everything, even if it is admitting a task was done the wrong way. Perhaps others Armywide are doing the same task the wrong way as well. In that case, we must change how the task is being performed. USASC investigators also have access to a worldwide accident database to determine trends and pinpoint recurring problems in different systems. Should your unit experience an accident or incident, report it. If we don't know about it, we can't fix it!

A timeline for the investigation already has been established before we arrive on-site. Phase one of the investigation is the organization and preliminary examination, where the board president has his or her inbrief, organizes the board, assigns duties and responsibilities, takes control of the site, and does an initial site assessment. Generally, this phase takes 1 to 2 days.

Phase two—data collection—begins on day 3. During data collection, we look not only at the accident, but also at the unit as a whole and the chain of command, up through the appropriate Major Command (MACOM). This process allows us to make accident prevention recommendations all the way up to the Department of the Army (DA). Not only do we handle witness summaries, we also inspect the unit's maintenance and personnel records, personnel equipment (kneeboards and ALSE), and duty logs; check weather; and perform any equipment teardown or operational checks. This process could take 3 to 8 days.

Analysis and deliberations make up phase three. At this point, we begin putting all the pieces together. In order for the correct conclusion to be reached, all the gathered information must be accurate and truthful. This process requires 4 to 7 days. Phase four—completing the field report—occurs between days 12 and 18. When the report is completed, the findings are staffed through USASC SMEs as a quality assurance measure. Once we have a "go" on our results, we outbrief the chain of command. The outbrief is made up of two parts: an informal pre-brief with the unit and their higher command (if time, location, and schedules permit), and then a formal outbrief with the MACOM involved.

For several different reasons, individuals often are reluctant to talk or interact with us. A few of these "myths" include:

- We are out to get the pilots or the crews.
- We are out to get the chain of command.
- We are here because the unit is messed up.
- We are here to upset as many people as we can in the shortest amount of time.

In fact, these myths couldn't be farther from the truth: We want to prevent another accident from happening, and we have very strong feelings about it.

There are several different factors that make people feel uncomfortable around us, too. Some of these include:

- We are from the outside, not part of that unit.
- We don't know the people involved.
- We disrupt the unit's routine.
- We ask that a lot of information be made available to us in a short amount of time.
- We aren't there because you had a good day.
- We are a DA-level investigation.

What accident investigations come down to ultimately is this: We take our jobs and your life very seriously. There is no need to feel uncomfortable; after all, accident investigations are conducted FOR ACCIDENT PREVENTION PURPOSES ONLY! We want to make sure the same accident doesn't happen again to your unit or another somewhere in the world. ♦

—CW4 David Laramore, Aviation Systems and Accident Investigation Division, USASC, DSN 558-9856 (334-255-9856), e-mail laramord@safetycenter.army.mil

There I was...

LTC Cynthia Gleisberg
U.S. Army Safety Center

The Need to Know

I was 18 and a student at Florida Institute of Technology (FIT), enrolled in the aviation program. I started college in July, right after my high school graduation to take advantage of a summer on the beach in Melbourne, FL. The FIT summer program was an accelerated course for earning my private pilot's license. I took academic classes each morning for 8 weeks and flew every afternoon.

Soon into the course, I got to make my first solo. Under the watchful (and prayerful?) eye of my instructor standing near the edge of the runway, I flew the traffic pattern three times with relatively smooth landings. That lesson was a great success (at least it seemed so to me).

After I had proven that I could land the aircraft without the aid of an experienced instructor, I was permitted to fly solo away from the airfield. On my first such solo, with just over 10 hours of flight experience, the syllabus called for me to fly to the training area and practice various maneuvers. I was to practice lazy 8s, turns about a point, and stalls.

I ran through the 8s and the turns several times each without any difficulty. I was quite confident in my flight skills, so I proceeded to practice stalls. The standard in the training syllabus was very clear: climb to 5,000 feet above ground level (AGL) to initiate the maneuver. I saw no purpose in that guidance. I was going to climb the aircraft, allow the wings to stall, let the nose fall forward, and gently add power and fly out of a shallow dive. I was flying a Piper Cherokee 140 and it was a very stable aircraft. I was great; the aircraft was great; I had nothing to fear...or so I thought.

In violation of the syllabus standard, I was about 1,200 feet AGL when I initiated my stall maneuver. I pulled back on the yoke, and the Cherokee started to climb. This climb was faster than I remembered from the prior stall practices with my instructor on board, and the airspeed was not bleeding off very quickly. I passed through 2,000 feet and continued climbing. I thought back to my 1 week of aerodynamics training

and realized that without my instructor's weight, the Piper would probably perform better. So, I banked the wing and entered a turn to add to the weight (g-load) of the aircraft. It was at that precise moment that the wings stalled.

Well, the way I practiced stalls in my vast 10 hours of experience was nose up, stall, fall forward, and pull out. This stall was different: nose up, BANK, stall, SPIN!!!! At first I thought, "This is cool!" Then, reality set in—I didn't know how to recover from a spin! I looked out my windshield and saw a flurry of green with a slight hint of blue swirling around it. I was in a steep dive with the aircraft spiraling VERY quickly to the ground.

I pulled back the yoke to bring up the nose, but the darn aircraft wouldn't respond! I pushed the yoke forward and pulled it back again. I guess I thought recycling the controls would change things. It didn't. I continued to spiral toward the ground. More green flurries and little spots of blue sky crossed my view.

Somehow, I ended up in such a steep dive that I was standing on the rudder pedals. My weight must have rested more on one pedal than the other because I stopped the spin. Once that happened, I was able to pull back on the yoke and get a response; finally, the aircraft pulled out of its crazy dive. I was barely 500 feet AGL. Within a few more seconds, the police would have been notifying my parents of my untimely death.

I pulled out of the dive and flew directly back to the airfield, scared and angry. I was scared because I had almost killed myself. It was my fault for not following the standard, but it was also my instructor's fault. When I asked her why she had not covered spin recovery with me before my solo, she told me I didn't need that yet. She also said that Cherokees were stable and unlikely to spin; thus, I never would need spin training while flying the Piper 140.

I encourage all instructors and unit trainers to recognize the overconfidence your junior aviators have in themselves and never assume they don't need to know something yet.

All crewmembers should know the steps to recover from every conceivable emergency.

My instructor was wrong! Yes, the aircraft is unlikely to spin, but when you make major weight changes to the aircraft such as halving the number of occupants, you change the normal characteristics. I weighed about 98 pounds at the time. My instructor weighed much more. That weight loss dramatically changed the flight characteristics. Instructors should cover those points with novice aviators.

When I first soloed in a TH-55, I was up to about 105 pounds and my instructor was pushing 240. He remembered to warn me that a different cyclic position would be needed to lift off to a hover without him in the aircraft. Had he not warned me, I might have had a dynamic rollover right on the ramp.

But, back to the story... The standard for 5,000 feet AGL maneuver starts was wise, but no one ever explained to me that the standard was for my benefit. It was to give me added time to recover the aircraft from the stall (or, in my case, spin!). If I had understood the purpose, I would have taken the standard more seriously.

I encourage all instructors and unit trainers to recognize the overconfidence your junior aviators have in themselves and never assume they don't need to know something yet. You never know when an emergency will occur, so all crewmembers should know the steps to recover from every conceivable emergency. ♦

—LTC Cindy Gleisberg is the Command Judge Advocate of the Army Safety Center and a former Black Hawk maintenance pilot with the 101st Airborne Division. She earned her FAA private pilot's license at the age of 18 and her commercial and instrument tickets before she was 20. She can be reached at DSN 558-2924 (334-255-2924) or e-mail cynthia.gleisberg@safetycenter.army.mil.

2003 Flightfax INDEX

ACCIDENT BRIEFS

Information based on preliminary reports of aircraft accidents

AH-64

D Model

■ **Class C:** At approximately 200 feet above ground level (AGL) and 80 knots true airspeed (KTAS) during aircrew training manual (ATM) training, the pilot on the controls attempted a nap-of-the-earth (NOE) deceleration. The rate of descent became excessive, and the aircraft descended to approximately 80 to 100 feet AGL. The aircraft then encountered brownout conditions, and the pilot in command (PC) took the controls to try to recover from the maneuver. However, the aircraft continued to descend and impacted the ground. The PC increased the collective to climb out of the brownout conditions, but the multifunction display (MFD) showed a UTILITY HYDRAULICS PSI warning and pressure dropped to 0 to 500 psi. The PC declared a precautionary landing, safely landed the aircraft, and called air traffic control to initiate aircraft recovery procedures.

CH-47

D Model

■ **Class C:** Aircraft encountered extremely dusty conditions during a battalion air assault mission while carrying a sling-loaded HMMWV. The pilot initiated an approach to the landing zone, which was a hard-ball road, but brownout conditions were encountered again. Visibility with the ground was lost. The crewmember calling the load was directed to release the vehicle as soon as it contacted the ground. The vehicle was released as it contacted the ground, and the HOOK OPEN lights illuminated. The pilot began his climb out, but the crewmember told him to stop because the forward hook did not open. The aircraft was unable to hold its position over the load due to the dust and the attempted climb. The pilot told the crewmember to release the load again, but the crewmember was slow to react. The load finally was released by the pilot.

OH-58

D(I) Model

■ **Class C:** Aircraft reportedly experienced engine and transmission overtorque readings (128 percent and 131 percent [mast] for 4 seconds, respectively) during a quick reaction force (QRF) mission.

D(R) Model

■ **Class A:** While attempting takeoff over an ordnance berm, aircraft experienced brownout conditions and struck the ground on the opposite side of the berm. The aircraft had refueled at a forward area refueling point (FARP) and had tried to climb over the berm several times. The aircraft's landing gear collapsed, and the tail boom, tail rotor, and main rotor were damaged in the accident. No personnel were injured.

■ **Class A:** Aircraft landed hard on a single-ship maintenance test flight. The hard landing caused the skids to spread, and the main rotor blade struck and severed the tailboom.

UH-60

L Model

■ **Class B:** Aircraft was Chalk Two in a flight of four conducting an air assault under night vision goggles (NVGs) when it hit a rock out-cropping in the LZ. Unaware of any damage, the crew returned the aircraft to the pickup zone (PZ), where the APU FIRE light illuminated. The APU was not running at the time, and the mission was halted. During post-flight inspection, damage was noted on the aft underbelly of the cargo door. The sheet metal, stringer, and antenna were damaged, and the tail rotor was scratched.

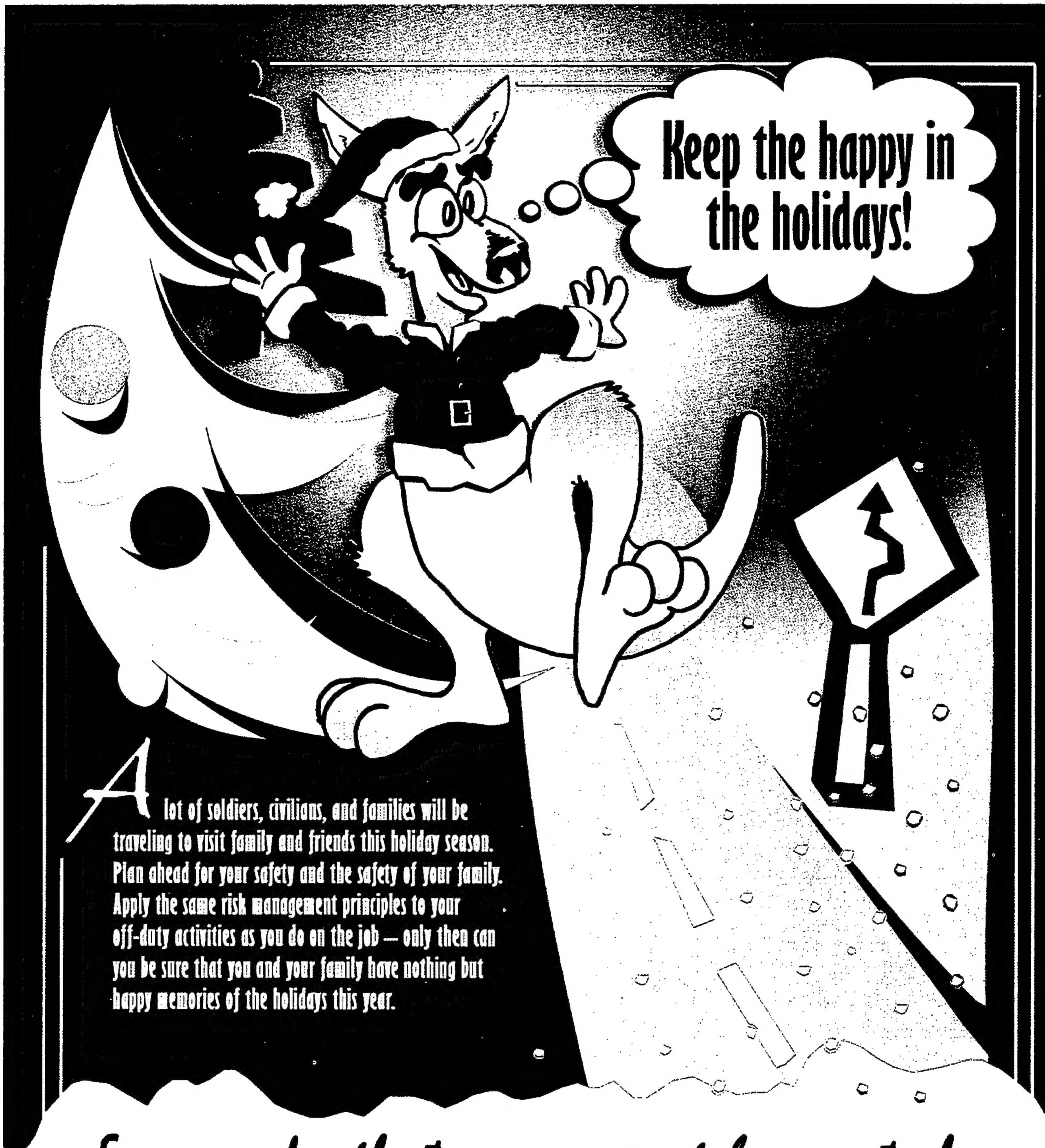
■ **Class C:** Aircraft was on final approach to landing when brownout conditions were encountered at 15 feet AGL. In response, a go-around was initiated. The crew chief (CE) told the PC that one passenger had exited the aircraft. The crew immediately landed the aircraft and began a search for the missing passenger. The missing soldier was found with fractures to the pelvis and femur. The aircraft was not damaged.

UH-1

V Model

■ **Class D:** At approximately 50 feet AGL and 30 knots indicated airspeed (KIAS) on an approach to a landing zone (LZ), the main rotor blades contacted a tree at the aircraft's 10 o'clock position. Climb power was applied, and the approach was aborted. The PC, who was in the left seat and on the controls, felt no abnormal indications in the flight controls and decided to return to the airfield. Post-flight inspection revealed damage to both main rotor blades.

Editor's note: **Information published in this section is based on preliminary mishap reports submitted by units and is subject to change. For more information on selected accident briefs, call DSN 558-9552 (334-255-9552) or DSN 558-3410 (334-255-3410). There have been numerous accidents in Kuwait and Iraq since the beginning of Operation Iraqi Freedom. We will publish those details in a future *Flightfax* article.**



From our family to yours, we wish you a truly happy, healthy, and safe holiday season.

U.S. ARMY SAFETY CENTER